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No. 24

TEXTILE MACHINERY

Prepared for the
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TEXTILE MACHINERY

Introduction and summary

Japan, though in the nineteen twenties heavily dependent on other countries for textile machinery, was in 1938 producing practically all the textile machinery it required and exporting it to the value of more than 30 million yen annually. The reversal in the machinery trade is shown in the tabulation below (because of the rapid, steady, and lasting nature of the change, comparison between single early and late years is more informative than averages of several years).

	1921	1928	1938
		(In million yen)	
Imports ----------	34,604	11,328	1,897
Exports ----------	4,431	3,072	32,229
Balance of exports (+) or imports (-)	-30,173	-8,256	+30,332

Japan has displaced Great Britain as the principal supplier of textile machinery in China; Korea and Manchuria also depend on Japanese machinery, and even British India was a purchaser. In the 5 years from 1932 to 1937 Japanese production rose in value from 27 million to 129 million yen. A summary of Japan's prewar supply in textile machinery is shown in table 1.

During the war most of the textile machinery shops of the world have been wholly or partly converted to war work. While some textile mills were able to keep their machinery in reasonably good repair, many were not; none have been able to expand, and many probably have been destroyed. A demand for textile mill equipment throughout the world far beyond the supply seems certain for some years after the war. If Japan were able and allowed to resume production it could serve its own textile industry (which probably will be in need of much repair and rehabilitation), and the far eastern market generally, at a time when world demand will be sufficient to occupy all producers.

On the other hand, the continuance or rebuilding of Japanese textile machinery shops will mean the presence of both equipment and personnel fitted for accurate machine work, which could be converted at short notice to production for war. After normal postwar balance is restored, Japan and all its former export markets could be supplied with textile machinery from the United States, Great Britain, or Switzerland. Some of the machinery from these latter areas might be somewhat better in quality than the Japanese. This probably would not be of as great consequence in the Far East, however, as would the higher prices which probably would exist. In addition, the large amounts of Japanese machinery which is in Japan and other far eastern countries will require replacement parts which could be supplied much more economically and more satisfactorily by the original producers in Japan than by machine shops in other countries.

then into a thick, loose strand, which is attenuated and twisted into a cohesive yarn. The yarn is intertwined with itself, or with a few other yarns, or with many, until a fabric is produced. This fabric may pass through many processes for changing its texture, color, and appearance. It may be made by the yard, for cutting up, or the machine may produce a stocking or other practically finished article. Many of these steps require a whole series of different machines, and usually there must be different, though similar, series for each fiber. Many types of fabric of the same fiber require different machines for all or a part of the process. One machinery manufacturer in the United States lists about 250 machines for finishing cloth in the wet state. Some of the principal groups of machines are: opening and preparing, carding, drawing, spinning, winding, weaving, knitting, braiding, and finishing machines. As there are many types of machines of each group, and as many of them are many feet long and contain hundreds of moving parts, the production of a complete line of machines involves complex processes and requires a large industrial organization.

Textile machinery is required for supplying clothing and other textiles for military purposes, but is long-lived, and most of the increased demand for textiles in wartime can be met by increasing the operating hours of textile mills. Of much military value, however, is the ability of textile machinery shops to produce other metal products. In the United States the personnel and equipment of such shops, prepared for accurate work, built howitzers, small boat turbines, and many parts for airplanes, guns, ammunition, and machine tools.

Table 1.- Textile machinery: Summary of production, imports, exports, and apparent consumption, Japan proper, 1928-39

(In thousands of yen)

Year	Production	Imports 1/	Exports			Apparent consumption
			To Empire areas 2/	Other	Total	
1928	3/	11,328	257	2,815	3,072	3/
1929	30,059	15,756	253	3,408	3,661	42,154
1930	21,222	7,824	175	3,677	3,852	25,194
1931	22,756	3,873	199	4,957	5,156	21,473
1932	27,479	8,021	114	3,536	3,650	32,350
Av., 1928-32-	4/ 25,379	9,460	200	3,678	3,878	4/ 30,293
1933	44,151	3,730	474	4,404	4,878	43,003
1934	64,654	8,270	980	7,798	8,378	64,546
1935	86,016	6,748	3,358	11,322	14,680	78,084
1936	99,339	2,925	3,721	13,579	17,300	84,964
1937	129,101	4,196	4,920	23,327	28,247	105,050
Av., 1933-37-	84,652	5,174	2,611	12,086	14,697	75,129
1938	110,726	1,897	6,958	25,311	32,269	80,354
1939	3/	242	3/	3/	3/	3/

1/ Imports from other than Empire areas only. 2/ Exports to Kwantung and Manchuria only in years 1928-34, also to Korea from 1935-38. 3/ Not available.
4/ Four-year average, 1929-32.
Source: Production, Japan Yearbook; trade, official returns of foreign trade of Japan, Korea, and Formosa.

The manufacture of textile machinery seems to have been well suited to the Japanese economy. Although the Japanese textile industry depended mainly on imported raw materials, production of textiles constituted a tremendous industry in Japan and afforded a sizable market for textile machinery. Production of the machinery used in the textile industry does not require large amounts of iron and steel and other raw materials, and this, together with the lower costs of textile machinery manufacture, resulting chiefly from cheap Japanese labor, made Japanese machinery attractive in Japan and throughout the Far East. Although the quality of the Japanese product was not always equal to that made abroad, if the machinery was less efficient it constituted no serious draw-back in the Far East where labor costs are generally low. In addition, the possibly slightly lower quality fabric produced in some cases was not difficult to dispose of in far eastern markets.

But, however well suited to Japanese economy, a large textile machinery making industry means shops and organizations well fitted for conversion to war work. Both the machines utilized and the personnel are capable of accurate work, and it is noteworthy that textile machinery shops in the United States produced large amounts of important war material.

Table 2 shows production of the principal classes of textile machinery in Japan since 1929.

Imports

In 1921, imports to the value of nearly 35 million yen supplied the major part of Japan's needs for textile mill equipment. Eighty-five percent of the value was reported as representing spinning machinery; it probably included machinery for the preparatory processes also. Imports came chiefly from Great Britain, France, and Germany. As domestic manufacture of textile machinery increased, imports declined, and after 1933 they averaged only about 5 million yen, or from 5 to 10 percent of consumption. Most of this decline was due to progress made in the domestic manufacture of preparing and spinning machinery. The manufacture of looms on a large scale preceded that of spinning machinery. Even in 1921 annual imports of looms were valued at less than 3 million yen, and had almost disappeared before the war. Imports of finishing machinery, of minor importance, were decreasing. Knitting machines were not so much used in Japan as elsewhere before the war; imports, though small, were increasing. Knitting machines and some spinning and weaving machinery came from the United States and Germany. Imports from Empire areas are not reported, and likely there were none.

Although Japanese firms before the war supplied nearly all the machinery for Japanese textile mills, some importation of machinery was common. Other countries which were leaders in its manufacture imported some textile machinery, because of specialization and design preferences or price differences.

Tables 3, 4, and 5 show imports by sources and kinds for recent years.

Table 3.- Textile machinery: Imports into Japan, by principal sources, 1928-38

(In thousands of yen)

Year	Great Britain	France	Germany	Switzerland	United States	Other	Total
1928	8,420	450	1,699	158	478	123	11,328
1929	8,539	2,586	2,657	475	1,458	41	15,756
1930	4,187	623	1,264	698	1,024	28	7,824
1931	1,327	483	1,421	281	314	47	3,873
1932	2,787	3,532	1,551	427	216	8	8,521
Average, 1928-32	5,052	1,535	1,718	408	698	49	9,460
1933	496	2,432	692	1	108	1	3,730
1934	1,379	2,494	3,452	23	565	357	8,270
1935	2,693	428	2,831	9	780	7	6,748
1936	1,116	591	884	4	322	8	2,925
1937	1,948	258	1,301	47	579	63	4,196
Average, 1933-37	1,526	1,241	1,832	17	471	87	5,174
1938	1,214	9	433	6	234	1	1,897

Source: Annual Return of the Foreign Trade of Japan.

Table 4.- Textile machinery: Imports into Japan, by types, 1921 and 1928-39

(In thousands of yen)

Year	Spinning	Weaving	Finishing	Knitting	Total
1921	29,180	2,973	2,123	328	34,604
1928	10,431	427	292	178	11,328
1929	14,486	637	411	222	15,756
1930	6,365	270	375	814	7,824
1931	3,512	55	161	145	3,873
1932	7,998	106	342	75	8,521
Average, 1928-32	8,558	299	316	287	9,460
1933	3,520	12	116	82	3,730
1934	6,395	40	62	1,773	8,270
1935	4,613	228	265	1,645	6,748
1936	2,278	91	147	407	2,925
1937	3,103	140	244	709	4,196
Average, 1933-37	3,982	102	167	923	5,174
1938	1,635	28	-	234	1,897
1939	60	1/	103	79	242

1/ Less than 500 yen.

Source: Annual Return of the Foreign Trade of Japan.

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Table 5.- Textile machinery: Imports into Japan, by kinds and countries, 1929 and 1936

(In thousands of yen)

Country	Spinning	Weaving	Finishing	Knitting	Total
			1929		
Great Britain	8,258	131	140	10	8,539
Germany	2,036	250	267	104	2,657
France	2,585	-	1/	1	2,586
Switzerland	451	24	1/	-	475
United States	1,124	227	2	105	1,458
Other	32	5	2	2	41
Total	14,486	637	411	222	15,756
			1936		
Great Britain	1,056	48	6	6	1,116
Germany	507	43	136	198	884
France	586	-	5	-	591
Switzerland	4	-	-	-	4
United States	117	1/	-	205	322
Other	8	-	-	-	8
Total	2,278	91	147	409	2,925

1/ Less than 500 yen.

Source: Annual Return of the Foreign Trade of Japan.

Exports

Textile machinery exports amounted to 10 percent or more of domestic production even as early as 1921, and after 1933 the percentage increased to 30 percent. Exports were valued at nearly 33 million yen in 1938. Both spinning and weaving machinery were exported--spinning machines, as might be expected, in the greater volume, as spinning requires the greater amount of machinery. Small amounts of knitting machinery were exported in the years before the war. In the prewar years 60 percent of the exports went to China, supplying most of that country's requirements. Japan was then selling, by value, three or four times as much textile machinery to China as was Great Britain. Exports to Kwantung, Manchuria, and Korea were increasing before the war, and reached 7 million yen in 1938. Exports to British India, 4.7 million yen in 1938, illustrate the competitive strength of the Japanese product in the Empire of one of the leading producers. Much Japanese textile machinery was sold in other markets.

Table 6.- Spinning and weaving machinery: Exports from Japan, by principal markets, 1928-39

(In thousands of yen)

Year	Empire areas			Other than Empire areas				Total
	Kwantung	Manchuria	Korea 1/	China	British India	Netherlands Indies	Other	
1928	218	39	2/	2,428	295	2/	92	3,072
1929	223	30	2/	2,980	325	2/	103	3,661
1930	166	9	2/	3,154	477	2/	46	3,852
1931	192	7	2/	4,512	329	2	114	5,156
1932	89	25	2/	2,698	712	3	123	3,650
Average, 1928-32	178	22	-	3,154	427	-	96	3,878
1933	338	136	2/	3,019	1,234	8	143	4,878
1934	385	195	2/	5,867	1,561	137	233	8,378
1935	879	346	2,133	9,011	1,699	260	352	14,680
1936	1,006	536	2,179	10,677	1,655	373	874	17,300
1937	857	1,256	2,807	15,901	4,439	1,439	1,548	38,247
Average, 1933-37	693	494	3/	8,895	2,118	443	630	3/
1938	1,117	3,556	2,285	19,288	4,661	792	570	32,268
1939	4/	4/	1,738	4/	4/	4/	4/	4/

1/ Imports into Korea from Japan.
2/ Not separately reported prior to 1935.
3/ Not available.
4/ Not separately reported by countries.

Source: Annual Return of the Foreign Trade of Japan, Tables of the Trade and Shipping of Korea, and Annual Return of the Trade of Formosa.

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If the industry were to be allowed in Japan and if manufacturing facilities were still in existence after the war, a substantial export trade with far eastern countries doubtless could be resumed. In post-war years demand for textile machinery throughout the world will exceed the supply, and if Japan were in position to produce, it could probably export more than before the war.

If the industry were not allowed, Japan's home market and all its export markets could in time be supplied from the United States, Great Britain, or Switzerland, although prices would be substantially higher than the Japanese, and the supply, short in any event, would be still shorter without Japan's capacity, in the immediate postwar years. Inability to obtain replacement and repair parts for Japanese-made machines already in existence would work a hardship on countries owning such machinery. While such parts could probably be produced in industrial countries other than Japan, the cost of such work would probably be excessive.

Table 6 shows Japanese exports of textile machinery by destinations, 1928-38.

Consumption

It is difficult to make a reasonably satisfactory estimate of Japanese requirements for textile machinery. The apparent consumption, as shown by value, from production, import, and export statistics, includes the machinery which went into the equipment of new mills. Expansion of cotton mill capacity went on at an average rate of 300,000 spindles a year for 35 years, but, from 1933 to 1938 nearly a million a year were added. The yen value of the wide variety of machinery accompanying these spindles is uncertain. Also unsatisfactory as a basis for estimates is an assumed depreciation of a constantly increasing volume of installed equipment having a life of 20, 30, or 40 years.

The value of machinery required annually to maintain the textile industry of Japan will, of course, depend upon the size of that industry in the postwar years, but assuming that the rapid expansion of the prewar era will not be resumed, it should be well under the 75 million yen of annual apparent consumption in the period 1933-37.

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The present report is one of a number which were prepared during 1944 and 1945 for the Foreign Economic Administration by members of the staff of the United States Tariff Commission. Owing to the desire of the Foreign Economic Administration to obtain this material as promptly as possible, the reports were not reviewed by the Tariff Commission. All statements of fact or opinion in these reports are attributable to the individual staff members who prepared them. The reports were originally intended for confidential use of Government agencies, but are now being made public with the consent of the Foreign Economic Administration.

FOREWORD A-25

This is one of a series of Special Industry Analyses discussing from a commodity or individual industry viewpoint the outstanding items entering into the trade of Japan proper with its Empire and with foreign countries. These analyses are a part of a larger project which includes compilations (annotated) of the imports and exports of Japan proper by sources and destinations; surveys of certain of the colonial areas, emphasizing their Empire and foreign trade and postwar problems relating thereto; an over-all study of the trade of Japan proper; and a survey of Japan's shipbuilding industry and shipping services and requirements in the prewar period. In all of the studies Manchuria has been included as an Empire area owing to the political, economic, and military dominance of Japan in that area, especially during the last decade.

Most of the data in these analyses were taken from official and semi-official Japanese sources. Not only have errors and inconsistencies frequently been detected within individual volumes, but many data from different sources supposedly reporting on the same subject are irreconcilable. It is very likely that large shipments of goods reportedly moving to Kwantung from Japan have been in large part merely transshipments destined for Manchuria.

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TABLES

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Japanese sulfur could be exported to Korea, China, and other countries in large quantities as reparations. It is one of a few commodities available from domestic resources in Japan proper in large amounts. Exports of sulfur from Japan in the past have been as high as 70,000 metric tons annually. Also if Japan is allowed to continue the production of paper and rayon, exports of these products, which consume sulfur in their manufacture, could be made as reparations payments. If the Japanese are not allowed to continue the manufacture of rayon, an additional quantity of sulfur, about 60-70,000 metric tons, would be available for export. If a total of 150,000 tons of sulfur were exported in the postwar period it would have a total value, on the basis of prewar prices of about 13 million yen. Sulfuric acid, because of the difficulty of transporting the corrosive material in large volume, should be processed into fertilizers and other non-military products, and these end products used to provide any reparations determined upon, in goods related to the acid.

Description and uses

The non-metallic element sulfur is a yellow solid, which occurs in nature in the free state. It also occurs in combination with various elements, principally as the sulfide of iron, copper, or other metals. The mineral pyrites which is a bisulfide of iron, is the most important source of combined sulfur. In addition to sulfur and pyrites, which are produced in large quantities in Japan, there are also relatively small amounts of sulfur ore mined in that country. The ore commonly contains from 40 to 60 percent of free sulfur mixed with native rock.

Sulfur, pyrites, and sulfur ore are used in most countries largely for the production of sulfuric acid, but in Japan sulfuric acid is made almost entirely from pyrites and sulfur ore. All three of these materials can also be used for the production of pulp and paper by the sulfite process, although only sulfur is used in common Japanese practice. Sulfur is also used for the manufacture of carbon bisulfide (which is used principally to produce rayon), sulfur dyes, insecticides, and many miscellaneous sulfur compounds.

Sulfuric acid, the principal heavy acid, is an oily, viscous, extremely corrosive liquid. It is produced in various concentrations, the principal commercial strengths being 50° Baumé or 62.5 percent sulfuric acid, 60° Baumé or 78 percent acid, 66° Baumé or 93.2 percent acid, and fuming sulfuric acid or oleums. Oleums are 100 percent sulfuric acid, containing varied amounts of dissolved sulfur trioxide, usually 20 or 40 percent

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Chamber acid or 55° Baumé sulfuric acid is used principally for the manufacture of the fertilizer materials, superphosphates and ammonium sulfate. Tower acid or 60° Baumé acid is used chiefly for pickling steel, tinning, and galvanizing. Concentrated oil of vitrol or 66° Baumé acid is employed for the purification of petroleum and the manufacture of other acids, as nitric and hydrochloric acid. Oleums are consumed in the manufacture of dyes, intermediates, nitroglycerin and nitrocellulose. A diluted sulfuric acid of 24° Baumé or about 27 percent sulfuric acid is used in storage batteries. Sulfuric acid also has many other uses, as in the manufacture of rayon and other textiles, for paints, and for the production of various chemicals.

Summary of Prewar Supply

The apparent consumption of sulfur in Japan increased from an average of 56,500 metric tons during the 5-year period, 1928-32, to 102,000 metric tons during the 4-years 1933-36. The sulfur content of pyrites and sulfur ore produced increased from an average of 280,000 metric tons during the 5 years 1928-32 to almost 580,000 metric tons in the 4 years 1933-36. Exports of sulfur increased from an average of 12,000 metric tons annually during the 5 years, 1928-32 to 51,000 metric tons per annum during 1933-37. The value of the exports in the latter period was only about 3.5 million yen annually. Nearly all of the sulfur and pyrites produced in Japan, were consumed within the country. Exports of sulfur in 1933-37 usually accounted for only 7-8 percent of the annual output of sulfur from all sources. (Sulfur and sulfur content of pyrites and sulfur ore.) (See tables 1 and 5.)

The production of <u>sulfuric acid</u> increased from 1 million metric tons as an annual average during 1928-32 to 2.2 million metric tons during the 5 years 1933-37. Exports always small in relation to production were approximately the same during both five-year periods, although the amount shipped to Empire area countries increased and exports to foreign countries declined. There were no imports of sulfuric acid. (See tables 2 and 6.)

Table 1.- Sulfur, pyrites, and sulfur ore: Summary of production, imports, exports, and apparent consumption in Japan proper, 1928-36

(In metric tons)

Year	Sulfur				Production 1/		Sulfur content of pyrites and sulfur ore 3/	Total sulfur consumption
	Production	Imports 2/	Exports	Apparent consumption	Pyrites	Sulfur ore		
1928	70,100	134	5,322	64,912	593,972	13,300	273,937	338,849
1929	65,500	180	10,442	55,238	618,743	15,100	285,984	341,222
1930	62,360	137	5,916	56,581	561,393	14,623	259,938	316,519
1931	61,499	-	14,183	47,316	560,372	2,230	253,282	300,598
1932	84,530	-	25,998	58,532	726,073	2,693	328,049	386,581
Average, 1928-32	68,798	4/ 151	12,372	56,516	612,111	9,577	280,238	336,754
1933	114,426	-	32,117	82,309	903,029	2,660	407,693	490,002
1934	135,412	-	45,710	89,702	1,090,484	4,782	493,109	582,811
1935	164,945	-	54,605	110,340	1,338,891	21,097	613,050	723,390
1936	198,237	-	71,870	126,367	1,750,914	32,100	803,961	930,328
1937	5/	-	55,845	-	5/	5/	-	-
Average, 1933-36	153,255	-	51,075	102,180	1,270,830	15,160	579,453	681,633

1/ No imports nor exports of this commodity are reported in official statistics.
2/ Exports from Formosa to Japan; not separately classified after 1930.
3/ Calculated on basis of sulfur content of 45 percent in pyrites and 50 percent in sulfur ore.
4/ Average for 1928-30.
5/ Not available; mineral production in Japan not reported after July 1937.

Source: Annual and Monthly Returns of Foreign Trade of Japan and Formosa; Nippon So[illegible] Shi.

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Table 2.- Sulfuric acid: [1] Summary of production, exports and apparent consumption in Japan proper, 1928-38 [2]

(In metric tons)

Year	Production	Exports		Apparent consumption
		To Empire areas	Other	
1928	613,342	1,650	6,058	605,634
1929	1,146,003	564	5,221	1,140,218
1930	975,768	596	4,684	970,488
1931	1,050,586	537	6,289	1,043,760
1932	1,334,104	927	3,433	1,329,744
Average, 1928-32	1,023,961	855	5,137	1,017,969
1933	1,614,138	1,507	3,702	1,608,929
1934	1,745,565	1,953	3,397	1,740,215
1935	2,006,050	1,876	2,984	2,001,190
1936	2,437,492	2,183	3,008	2,432,301
1937	3,201,435	2,223	4,945	3,193,267
Average, 1933-37	2,200,936	2,148	3,607	2,195,180
1938	2,749,309	7,124	2,687	2,739,498

1/ Includes varying strengths of sulfuric acid as produced or exported.
2/ Imports not reported. Probably there were none.

Source: Annual and Monthly Returns of the Foreign Trade of Japan; Nippon Soda Kogyo Shi.

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Production

Japanese production of sulfur increased from 61,500 metric tons, valued at 3.2 million yen, in 1931 to 165,000 metric tons valued at 10.3 million yen in 1935. In the following year, 1936, production was almost 200,000 tons, and in the first 7 months of 1937 was 140,502 metric tons. (See table 3.)

Sulfur is produced in over 50 different mines, located in Japan proper and in the Kuriles. Three companies--Matsuo Mine K.K. located in Iwate Prefecture, Honshu Island; Hokkaido Sulfur K.K., located in Iburi Prefecture, Hokkaido Island; and the Nippon Sulfur K.K.--produced about 75 percent of the total Japanese output in 1936. (See table 3.)

Pyrites production in Japan has increased from 560,000 metric tons valued at 6.1 million yen in 1931 to about 1.4 million metric tons valued at 13.4 million yen in 1935. The production in 1936 was 1.75 million metric tons. (See table 3.)

There are a considerable number of pyrites mines in Japan proper, but as in the case of sulfur a few mines produce the bulk of the output. The Yanahara mine, located in Okayama Prefecture, Honshu Island, produced 502,000 metric tons in 1936; the Matsuo mine, Iwate Prefecture, Honshu Island produced 455,000 tons; the Besshi mine, Ehime Prefecture, Shikoku Island produced 160,000 tons, and the Hitachi mine, Ibaraki prefecture, Honshu Island produced 105,000 tons. The production of these 4 large mines amounted to more than 60 percent of the total production in Japan during 1936.

The relatively small output of sulfur ore in Japan is an unrefined material obtained from certain of the Japanese sulfur mines.

Sulfuric acid was produced in 117 plants in Japan proper during 1937. Production increased fairly steadily from 1.2 million metric tons of 50° Baumé acid valued at 20.2 million yen in 1930 to 3.9 million tons of 50° Baumé acid valued at 68.7 million yen in 1937. (See table 4.) Of the 117 plants producing the acid, 54 were producers of chamber acid, 12 produced 60° Baumé acid, 39 plants produced 65° Baumé acid and 12 plants produced fuming sulfuric acid or oleums.

Table 3.- Sulfur, pyrites, and sulfur ore: Production in Japan proper, 1928-36

Year	Sulfur		Pyrites		Sulfur ore	
	Quantity	Value	Quantity	Value	Quantity	Value
	Metric tons	1,000 yen	Metric tons	1,000 yen	Metric tons	1,000 yen
1928	70,100	1/	593,972	1/	13,300	1/
1929	65,500	1/	618,743	1/	15,100	1/
1930	62,360	3,396	561,393	7,029	14,623	301
1931	61,499	3,166	560,372	6,091	2,250	1/
1932	84,530	4,616	726,073	7,515	2,633	2/
Av., 1928-32	68,798	-	612,111	-	9,377	-
1933	114,426	7,500	903,129	9,975	2,660	28
1934	135,412	9,019	1,090,484	10,734	4,782	50
1935	164,945	10,244	1,388,891	13,423	21,097	221
1936	198,237	1/	1,759,934	1/	32,199	1/
Av., 2/ 1933-36	153,255	-	1,270,830	-	15,160	-

1/ Not available.
2/ Japanese production of minerals not reported after July 1937 under provisions of "Military Secrets" Law.

Source: Nippon Soda Kogyo Shi. December 1938, page 249.

Table 4.- Sulfuric acid: Production of various acid strengths in Japan proper, 1928-38

(Quantity in thousands of metric tons; value in thousands of yen)

Year	Chamber acid		60° Baumé acid		65° Baumé acid		Fuming sulfuric acid or oleums		Total calculated as 50° Baumé acid	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
1928 1/	-	-	-	-	-	-	-	-	980	23,004
1929	846	19,164	19	952	259	7,956	22	1,304	1,382	29,367
1930	796	13,074	38	817	134	5,780	7	560	1,145	20,231
1931	888	12,227	58	1,255	100	4,086	5	350	1,219	17,918
1932	1,172	16,433	53	1,537	103	3,930	7	477	1,538	22,377
Average, 1929-32	926	15,225	42	1,140	149	5,438	10	673	1,321	22,476
1933	1,403	22,678	21	552	181	7,140	9	649	1,874	31,019
1934	1,497	20,449	16	507	221	9,363	12	855	2,035	31,174
1935	1,627	23,156	23	867	305	11,626	50	1,841	2,377	37,490
1936	1,878	28,805	19	561	364	13,040	177	5,464	2,951	47,870
1937	2,305	40,025	130	2,675	576	19,103	190	6,910	3,897	68,713
Average, 1933-37	1,742	27,023	42	1,032	329	12,054	88	3,144	2,627	43,253
1938	1,791	34,645	136	3,364	627	27,079	196	5,986	3,411	71,074

1/ Total sulfuric acid production reported as 613,342 metric tons (probably as 100 percent sulfuric acid). Factors used to convert various strengths to 50° Baumé acid are: Chamber acid - 1.12; 60° Baumé acid - 1.25; 65° Baumé acid - 1.44; Fuming sulfuric acid or oleums - 1.7.

Source: Nippon Soda Kogyo Shi, December 1938, page 248.

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Imports

Japanese import statistics do not separately classify imports of sulfur, pyrites, or sulfur ore. The Annual Returns of the Trade of Formosa shows sulfur exports to Japan of 134 metric tons, valued at 10,859 yen in 1928; 180 metric tons, valued at 15,596 yen in 1929; and 137 metric tons, valued at 10,868 yen in 1930. The exports from Formosa were not separately classified after 1930. Korea is known to be on an import basis in sulfur and pyrites.

Japanese imports of sulfuric acid have been negligible; the only record of any imports being 132 metric tons from Empire sources imported during 1938.

Exports

Japanese exports of sulfur increased from 12,400 metric tons, valued at 771,000 yen, during the 5 years 1928-32 to 52,000 metric tons valued at 3.5 million yen during the 5-year period 1933-37. (See table 5.) These exports went principally to Australia, New Zealand, British India, and China. No exports of sulfur to Korea and Formosa are reported in official trade statistics.

Exports of sulfuric acid from Japan, other than to Korea and Formosa, declined slightly from 5,690 metric tons, valued at 602,000 yen, during 1928-32, to 4,536 metric tons, valued at 390,000 yen during 1933-37.

Sulfuric acid exports were principally to China, the Philippine Islands and the Straits Settlements, and to the Empire areas of Kwantung, Manchuria, and Korea. Exports to Korea were larger than to any other Empire or foreign area, and increased rapidly in 1939 and 1940, owing to the rapid industrialization of Korea, especially in chemicals. (See table 6.)

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Table 5.- Sulfur: Exports (domestic produce) from Japan, by principal countries, 1928-39

Year	New Zealand	Australia	British India 1/	China	Manchuria (Manchukuo)	Kwantung	All other	Total
				Quantity (metric tons)				
1928	-	-	106	2/ 3,501	3/	479	1,236	[illegible]
1929	6,310	-	114	2/ 1,992	3/	467	1,559	10,442
1930	-	-	80	2/ 4,162	3/	274	1,400	5,916
1931	10,192	-	66	2/ 2,770	3/	260	894	14,183
1932	7,650	11,583	1,470	1,109	2,149	482	1,554	25,998
Average, 1928-32	4,830	2,317	367	2,707	4/	392	1,329	12,372
1933	3,161	18,163	4,862	1,529	2,575	701	1,126	32,117
1934	21,119	13,533	4,696	1,743	2,289	567	1,763	45,710
1935	16,882	20,238	12,360	2,214	53	468	2,390	54,605
1936	20,941	31,082	11,281	2,364	1,217	1,290	3,695	71,870
1937	20,416	17,170	10,595	1,807	2,448	1,032	2,377	55,845
Average, 1933-37	16,504	20,037	8,759	1,931	1,716	812	2,270	52,029
1938	5,113	10,179	5,102	939	8,750	647	511	31,241
1939								5/ 27,953
				Value (1,000 yen)				
1928	-	-	14	2/ 302	3/	43	105	464
1929	310	-	19	2/ 195	3/	44	125	693
1930	-	-	14	2/ 372	3/	25	101	512
1931	432	-	16	2/ 228	3/	17	60	753
1932	338	605	129	87	112	35	129	1,435
Average, 1928-32	216	121	38	237	4/	33	104	771
1933	217	1,308	408	136	202	57	103	2,431
1934	1,219	792	380	147	170	42	137	2,887
1935	979	1,190	954	253	5	34	194	3,609
1936	1,230	1,917	824	211	85	83	333	4,733
1937	1,262	1,101	843	165	204	95	213	3,883
Average, 1933-37	991	1,262	682	182	133	62	197	3,509
1938	324	655	454	89	711	64	53	2,350
1939								5/ 2,842

1/ Includes Ceylon prior to 1934 and Burma prior to 1938.
2/ Includes Manchuria.
3/ Not separately reported.
4/ Not available.
5/ Country detail not available.

Source: Annual and monthly returns of Foreign Trade of Japan.

Table 6.- Sulfuric acid: Exports of domestic produce from Japan, by principal markets, averages, 1928-32 and 1933-37, annual, 1938-39

Year	Philippine Islands	China	Straits Settlements	Hong Kong	Kwantung	Manchuria	Korea 1/	All other	Total
	Quantity (metric tons)								
Average, 1928-32	596	3,080	288	802	326	227	302	371	15,992
Average, 1933-37	841	1,128	612	247	805	123	1,219	780	5,755
1938	1,032	652	202	58	783	422	5,919	743	9,811
1939	2/	2/	2/	2/	2/	2/	12,545	2/	30,656
	Value (1,000 yen)								
Average, 1928-32	58	329	30	81	33	30	46	41	648
Average, 1933-37	65	97	51	20	76	11	149	70	539
1938	100	69	19	5	117	59	552	72	993
1939	2/	2/	2/	2/	2/	2/	1,227	2/	2,863

1/ Imports into Korea from Japan; such imports in 1940 amounted to 18,686 metric tons valued at 1.9 million yen.

2/ Detail of exports by countries not available.

Source: Official foreign trade returns of Japan and Korea.

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Table 7.- Sulfuric acid: Consumption in Japan, by principal uses, 1928-37

(Quantities in metric tons of 50° Baumé acid)

Year	Production			Production for ammonium sulfate	Percent of total	Other 2/	Percent of total
	Total 1/	For superphosphate	Percent of total				
1928	980,000	653,000	66	252,000	26	75,000	8
1929	1,382,000	640,000	46	278,500	20	463,500	34
1930	1,145,000	570,000	50	318,500	28	256,500	22
1931	1,219,000	575,000	47	440,000	36	204,000	17
1932	1,538,000	655,000	43	492,000	32	391,000	25
Average, 1928-32	1,321,000	618,600	47	356,200	27	346,200	26
1933	1,874,000	774,000	41	538,000	29	562,000	30
1934	2,035,000	717,000	35	631,000	31	687,000	34
1935	2,377,000	887,500	37	720,000	30	789,500	33
1936	2,951,000	933,000	32	1,045,000	35	973,000	33
1937	3,897,000	1,035,500	27	1,100,000	28	1,761,500	45
Average, 1933-37	2,627,000	865,400	33	806,800	31	954,800	36

1/ Production data from table 4.
2/ Includes exports.

Source: Calculated from Japanese production of superphosphate and ammonium sulfate in Kojo Tokeihyo, 1937.

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Government control

The distribution and prices of sulfur, pyrites, and sulfuric acid are controlled in Japan by semi-governmental companies or associations. Sulfur is controlled by the Japan Sulfur Control Association, pyrites by the Sulfide Ore Distributors' Association and sulfuric acid by Joint Sulfuric Acid Sales Companies in east and west Japan.

Due to an underground fire in November 1939 in the Matsuo Mine, which produced about 25 percent of the output of sulfur in Japan, the supply of sulfur was placed under strict distribution control by an ordinance of the Ministry of Commerce and Industry. No sales were permitted without an allotment certificate from the Japan Sulfur Control Association. Producers of sulfur were required to submit estimates of quarterly production and sales agencies and consumers had to submit detailed estimates of their probable sales and consumption.

Detailed information on governmental control of sulfuric acid distribution is not available, but it is apparent that the manufacturers of ammonium sulfate and superphosphates were granted priorities in obtaining their requirements at the expense of less essential industries.

Postwar problems

Japanese sulfur production, which in the past has been used principally for the manufacture of paper and rayon, or exported, could be employed in making reparations to China, Korea, and other countries, either in its original form or as the final sulfur products. The use of sulfur in the manufacture of black powder could be controlled by restricting the use of potassium nitrate, the principal constituent of this explosive.

There is no necessity for controlling the output of pyrites in Japan as this can be done more effectively by limiting the output of sulfuric acid. The biggest part of Japanese capacity for the production of sulfuric acid is by the chamber process, which produces a weaker acid used principally for the manufacture of fertilizers. The contact process plants in Japan, which have an annual production capacity of about 650,000 metric tons, should be destroyed if it is desired severely to hinder the manufacture of a material necessary for the production of nitroglycerin, nitrocellulose, and dye intermediates. As sulfuric acid is difficult to transport in large quantities because of its corrosive nature, the export of this acid to any great extent as reparations would be impracticable. It would be more desirable to allow the manufacture of finished non-military products made from sulfuric acid, particularly ammonium sulfate and superphosphate, and then export these items as reparations. It appears that severe limitations on the chemical industry generally would greatly reduce the need for sulfuric acid in Japan in uses other than the manufacture of fertilizers.